


National trends in hospitalizations among patients with colorectal cancer in the United States

Udhayvir Singh Grewal, MD^a , Harsh Patel, MD^b, Shiva Jashwanth Gaddam, MD^a, Aakash Rajendra Sheth, MD^a, Subhash Chandra Garikipati, MD^a, and Glenn Morris Mills, MD^{c,d}

^aDepartment of Internal Medicine, Louisiana State University Health Sciences Center, Shreveport, Louisiana; ^bDepartment of Internal Medicine, Louis A. Weiss Memorial Hospital, Chicago, Illinois; ^cDepartment of Hematology and Oncology, Louisiana State University Health Sciences Center, Shreveport, Louisiana; ^dFeist Weiller Cancer Center, Shreveport, Louisiana

ABSTRACT

Colorectal cancer is the second leading cause of cancer-related death in the United States, with a rising incidence, especially in young adults. Care for patients with colorectal cancer is associated with significant healthcare costs and expenditures. We retrospectively interrogated the National Inpatient Sample for admissions in patients with colorectal cancer from 2007 to 2017. A total of 1,962,705 admissions were identified: 50.2% were men, 64.4% were white, and the median age was 68. Most admissions (47.8%) that were coded for anatomical location of malignancy were for ascending colon cancer. The average in-hospital mortality was 4.9%, with a lower mortality in admissions with ascending colon cancer (2.9, $P < 0.001$). The median length of stay was 5 days, with a longer stay in admissions with transverse colon cancer (9 days, $P < 0.0001$). The median cost of hospitalization was \$12,295 and was significantly higher for patients with descending colon malignancy (\$16,369, $P < 0.0001$). The number of annual hospitalizations stayed steady overall but increased by 98.6% for rectosigmoid cancer. Our findings highlight the high costs of hospitalization and the overall economic burden associated with inpatient admissions among patients with colorectal cancer.

KEYWORDS Colon cancer; colorectal cancer; hospital admissions; inpatient outcomes

Colorectal cancer is the second leading cause of cancer-related death in the United States, contributing approximately 21% and 14.4% to the global incidence and mortality burden of colorectal cancer, respectively.¹ There is also a growing concern regarding the rising incidence of colorectal cancer among young adults in the United States.² Care for patients with colorectal cancer is associated with significant healthcare costs and resource utilization.³ A study of a national claims database showed that 86.9% of patients with metastatic colon cancer had a hospital admission at some point during their disease course, while 55.5% had at least one emergency room visit at some point. Inpatient and outpatient costs have been determined to be the key cost drivers in the medical management of these patients.⁴ With the rising incidence of colorectal cancer among young adults, the associated economic burden is only expected to rise. The current study was conducted to

analyze trends in admissions and healthcare resource utilization related to hospitalizations in patients with colorectal cancer.

METHODS

We retrospectively interrogated the National Inpatient Sample for admissions among patients with colorectal cancer from 2007 to 2017 using appropriate ICD-10 diagnosis codes. Data were stratified based upon the anatomical site and were analyzed for datapoints such as length of stay, cost of hospitalization, and inpatient mortality. Stage was not included in the analysis, as most cases were not coded to accurately reflect the stage of colorectal cancer. Chi-square test was used for categorical data and Student's *t* test was used for continuous variables. A *P* value < 0.05 was considered statistically significant. Trends in hospitalizations were assessed using a linear-by-linear association test among

Corresponding author: Glenn Morris Mills, MD, Feist Weiller Cancer Center, 1501 Kings Highway, Shreveport, LA 71103 (e-mail: glen.mills@lsuhs.edu)

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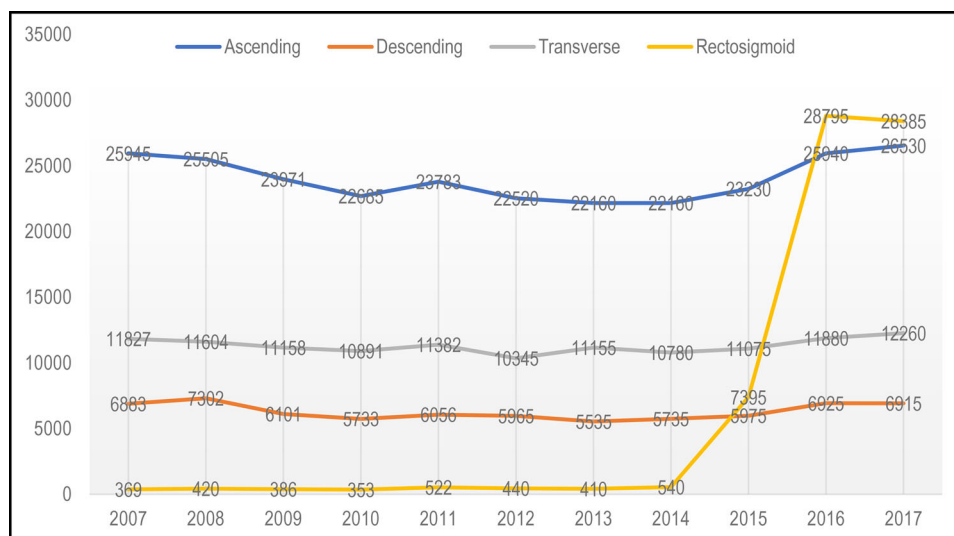


Figure 1. Temporal trends in annual admissions among patients with colorectal cancer, stratified by anatomical location, 2007 to 2017.

inpatient encounters for colorectal cancer. SAS version 9.4 (SAS Institute Inc.) was used for statistical analysis.

RESULTS

Among the 1,962,705 admissions identified, 50.2% admissions were men, 64.4% were white, and the median age was 67.7 years (53.8–81.6 years). A total of 525,923 admissions were coded for anatomical location of primary malignancy, out of which the most common was ascending colon cancer (264,427, 50.3%), followed by transverse colon cancer (124,357, 23.7%), descending colon cancer (69,125, 13.1%), and rectosigmoid cancer (68,014, 12.9%). Overall, 60.7% of the admissions were nonelective; Medicare was the primary payer for 58.6% of admissions, followed by private insurance (27.5%), Medicaid (8.5%), and others (5.4%). Most admissions belonged to the lower income quartile (28.3%) and were concentrated in large (58.9%), urban teaching hospitals (53.4%) in the Southern US (38.8%). Hypertension (53.6%) and diabetes mellitus (18.6%) were the most common comorbidities. The average in-hospital mortality for all admissions with colon cancer was 4.9%. When stratified by anatomical location, mortality was highest and lowest in admissions with rectosigmoid cancer (4.5%) and ascending colon cancer (2.8%) as the primary diagnosis, respectively ($P < 0.0001$). The median length of stay for all admissions was 5 days and was higher in admissions with transverse colon cancer (7 days, $P < 0.0001$). The median cost of hospitalization was \$12,295 and was significantly higher for admissions with descending colon malignancy (\$16,369, $P < 0.0001$). The number of annual hospitalizations stayed steady overall but increased by 98.6% for rectosigmoid cancer (Figure 1). The sharpest increment in the increased number of admissions for rectosigmoid cancer was observed from 2014 to 2016.

Out of a total of 1,962,705 admissions, 108,711 were in those 18 to 44 years. In comparison with admissions ≥ 45 years, younger admissions were more likely to represent racial

minorities such as African Americans (15.8% vs 12.5%), Hispanics (13.9% vs 7.0%), and Asians (3.9% vs 2.7%) than Caucasians (52.4% vs 65.1%), and the difference was statistically significant ($P < 0.0001$). Rectosigmoid cancer (5.42% vs 3.35%) and descending colon cancer (4.08% vs 3.49%) represented a higher proportion of cases in the younger group ($P < 0.0001$). Admissions in the younger age group also had a significantly higher percentage of obesity (9.3% vs 8.5%), depression (8.1% vs 7.6%), drug abuse other than tobacco and alcohol (2.5% vs 0.8%), as well as a family history of gastrointestinal malignancies (6.9% vs 3.0%) compared to admissions in the older age group ($P < 0.0001$). Patients in the older age group had a higher inpatient all-cause mortality (5.0% vs 3.1%, $P < 0.0001$) and median cost of hospitalization (\$12,330 [\$97,082, \$20,503] vs \$11,605 [\$6,332, \$19,828], $P < 0.05$) than younger admissions. However, there was no difference between the two groups in the median length of hospital stay (5 days [3–8 days] vs 5 days [3–9 days], $P > 0.05$).

DISCUSSION

The current analysis highlights the high costs of hospitalization and overall economic burden associated with inpatient admissions among patients with colorectal cancer. Despite accounting for the highest number of hospitalizations, ascending colon cancer had the lowest in-hospital mortality. Studies in the past have shown that patients with metastatic colon cancer who have a left-sided primary tend to have better overall outcomes than patients who have a right-sided primary.^{5,6} However, this has been found to be true only for late-stage patients. Studies have shown that the prognosis of stage I and II right-sided colon cancer is better than stage I and II left-sided colon cancer.⁷ The findings of our study could possibly be explained by a predominance of early rather than late-stage patients. The cost of hospitalization and median length of stay were the highest for admissions with descending colon cancer and transverse colon

cancer, respectively. The higher cost of hospitalization among admissions with descending colon cancer could possibly be due to the higher occurrence of lower gastrointestinal bleeding and higher rates of laparoscopic surgery in these patients.⁸ The National Inpatient Sample does not allow the analysis of granular data to identify newly diagnosed patients and effectively differentiate them from patients who have received anticancer therapy. We were also unable to extract granular data to evaluate various factors predictive of longer length of stay and higher cost of hospitalization.

In our analysis, the number of annual hospitalizations significantly increased for rectosigmoid cancer. This coincides with the rising incidence of colon cancer among young adults. Our results concur with previous studies that have indicated that colon cancer in young adults tends to have a predilection for the distal colon and rectum.⁹ The current analysis also confirms that colon cancer among young adults disproportionately affects minorities such as African Americans and Hispanics.¹⁰ Further studies need to investigate the role of risk factors such as obesity and illicit drug use in driving this epidemic.

In conclusion, the current analysis shows that despite accounting for the highest number of hospitalizations, ascending colon cancer had the lowest in-hospital mortality. The cost of hospitalization and median length of stay were highest for patients with descending colon and transverse colon cancer, respectively. The number of annual hospitalizations has significantly increased for rectosigmoid cancer, likely due to the rising incidence of colorectal cancer in young adults. Our findings may help inform physicians and healthcare administrators in devising appropriate strategies to efficiently channel healthcare resources to decrease the overall economic burden associated with hospitalizations in patients with colorectal cancer.

ORCID

Udhayvir Singh Grewal  <http://orcid.org/0000-0002-9638-3629>

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